IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

ROBERT GRAY, and MARKUM GEORGE, individually, and on behalf of a class of similarly situated individuals, Plaintiffs, v. BMW OF NORTH AMERICA, LLC and BMW AKTIENGESELLSCHAFT, Defendants.	**Civ. Ac. No.: 2:13-cv-3417-WJM-MF** **SUPPLEMENTAL DECLARATION OF KIRK D. KLECKNER**

KIRK D. KLECKNER, of full age, declares as follows:

1. I submitted a declaration dated June 22, 2017 for the above referenced matter regarding the valuation of the Settlement.

2. Attorneys for the Defendants stated the following in Point III (A) of Defendants' Brief In Response To Plaintiffs' Motion For Approval Of Attorneys' Fees, Costs, And Incentive Awards: *"Kleckner claims 21,976 class vehicles of the 30,344 total vehicles originally in the class remain on the road. He does not say how he reached this number[2]"*.

3. The Defendants further state in referenced footnote 2: *"Kleckner also fails to provide the support for his claimed calculations of the remaining class vehicles on the road to begin with. He generally references "data" from the National Highway Traffic Safety Administration (NHTSA), however, he neither specifies what data he used nor references the NHTSA report he relied upon."*

4. In response to such statements, I declare as follows:

a. I illustrated the calculation of the 21,976 class vehicles three times in my declaration (see calculations in each of Exhibits B, D and F).

b. I referenced the NHTSA report relied upon by including in EXHIBIT B – Primary Materials Considered the following: "*Vehicle Survivability and Travel Mileage Schedules, January 2006*, National Highway Traffic Safety Administration".

c. The specific data within such report that I relied on was Table 7. A copy of such report is attached to this Supplemental Declaration as Exhibit 1.

5. Attorneys for the Defendants stated the following in Point III (C) of Defendants' Brief In Response To Plaintiffs' Motion For Approval Of Attorneys' Fees, Costs, And Incentive Awards: *"Next, Kleckner assumes that each vehicle will have 2 to 3 owners over the course of its useful life and then further assumes that each and every owner in the chain will incur a separate repair expense associated with the class vehicles, as opposed to the potential that every vehicle might incur a repair. This results in the number of repairs doubling or tripling – and, with that, the "value" to the Class."*

6. In response to this statement, I declare as follows:

a. I did not assume each and every owner will incur a separate repair expense.

i. As described in my declaration paragraph 5(e) (ix) I stated *"…I estimated that the number of consumers that would incur an eligible repair or replacement would be one-third of the annual rate…"* This one-third rate was included in deriving the factor on the line "Calculated Percentage That Will Pay For Repair" within my original declaration's Exhibit F.

ii. As described in my declaration paragraph 5(e)(vii), of the vehicle owners that sustained a convertible top failure, my estimate is that 18,368 vehicle owners (of a total 78,930) would actually pay to repair the convertible top over the average in-service years after the new vehicle warranty period expired.

iii. The above two estimates along with the number of Post Warranty Period Average In-Service Years are the components of the line item "Calculated Percentage That Will Pay For Repair" within my original declaration's Exhibit F.

b. Attorneys for the Defendants believe considering the number of owners is improper. I disagree.

i. First, the settlement terms were based on individual owners, not vehicles. According to the settlement provision B1: *"Convertible Top Repair. Each Class Member will be entitled to submit a claim for reimbursement of eligible out-of-pocket expenses incurred for up to two (2) repair attempts for the Convertible Top Defect resulting from a defect …"*, and B2 *"Convertible Top Replacement. Each Class Member will also be entitled to submit a claim for reimbursement of eligible out-of-pocket expenses incurred for one (1) complete convertible top replacement necessitated by the Convertible Top Defect resulting from a defect…."* Thus, the settlement's limiting factor is Class Members (individual owners) not Class Vehicles.

ii. Second, Defendants incorrectly argue that once the vehicle is repaired it is fixed. This was not the reality as the software update fix included as part of the settlement has not even been implemented yet. Thus, each Class Vehicle could have incurred multiple qualified reimbursable repairs and many did.

I declare under penalty of perjury that the foregoing is true and correct. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment. Executed this 12th day of July, 2017, at Blaine, Minnesota.

KIRK D. KLECKNER

EXHIBIT 1

U.S. Department of Transportation
National Highway Traffic Safety Administration

www.nhtsa.dot.gov
nhtsa
people saving people

DOT HS 809 952 January 2006

Technical Report

VEHICLE SURVIVABILITY AND TRAVEL MILEAGE SCHEDULES

Published By:
NHTSA's
National Center for Statistics and Analysis

NCSA

Technical Report Documentation Page

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Vehicle Survivability and Travel Mileage Schedules	January, 2006
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National Center for Statistics and Analysis Regulatory Analysis and Evaluation Division National Highway Traffic Safety Administration U.S. Department of Transportation NPO-130, 400 Seventh Street, S.W. Washington, DC 20590	11. Contract of Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation NPO-130, 400 Seventh Street, S.W. Washington, DC 20590	NHTSA Technical Report
	14. Sponsoring Agency Code

15.Supplementary Notes

16. Abstract

This document serves to update the 1995 document of the same title. In this revision, we attempt to retain the methodology as much as possible from the previous release. Regardless, some changes were introduced in this updated analysis when needed. In this revision, we find that passenger cars and light trucks are being driven farther in their lifetimes (approximately 26,000 miles more per vehicle class). However, whereas younger passenger cars (less than 20 years old) are surviving slightly longer relative to the previous study, light trucks are not surviving as long as before early on in their existence, presumably due to the fact that they are being used more often as passenger vehicles than strictly for cargo.

The updated analysis shows that a typical passenger car will travel a lifetime mileage of 152,137 miles, while light trucks will travel 179,954 miles. Passenger car lifetime weighted present discount factors at 3 percent, 7 percent and 10 percent are, respectively, 0.8304, 0.6700 and 0.5824; for light trucks with the same discount rates, respectively, 0.8022, 0.6303 and 0.5419.

17. Key Words	18. Distribution Statement
VMT, vehicle miles traveled, survival rate, survivability, discount factors, lifetime vehicle mileage	Document is available to the public through the National Technical Information Service, Springfield, VA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No of Pages	22. Price
Unclassified	Unclassified	40 (including title page)	

Form DOT F1700.7 (8-72)

Table of Contents

Executive Summary

Vehicle survivability and vehicle miles traveled (VMT) schedules for passenger cars and light trucks were developed from 1977 to 2002 registration and 2001 mileage survey data. Compared to similar projections made in 1995, we found that passenger cars are lasting longer whereas light trucks are not lasting as long. However, both are being driven slightly farther than previous schedules had indicated.

In this analysis, vehicle age was cut off for passenger cars and light trucks when the Estimated Survival Rate reached an approximately two percent threshold. Thus, the lifetime VMT of passenger cars was extended to 25 years to arrive at 152,137 miles; and the lifetime VMT of light trucks was extended to 36 years to arrive at 179,954 miles. Previous lifetime VMT estimates were 126,665 for passenger cars (20 years) and 153,698 (25 years) for light trucks. Discount factors are also updated in this analysis and summarized below along with the lifetime mileage.

	Lifetime Mileage	**Lifetime Weighted Present Discount Factor**		
		3%	*7%*	*10%*
Passenger Car	152,137	0.8304	0.6700	0.5824
Light Truck	179,954	0.8022	0.6303	0.5419

These updated schedules should be used to assess the effects of proposed fuel economy and safety standards.

1. Introduction of Current Survivability and VMT Schedules

Survivability and vehicle mileage by age schedules are needed to accurately assess the impact of automotive fuel economy standards and safety standards. The survivability schedule can be used to estimate the phase-in of new safety equipment into the vehicle fleet. These two schedules are used to compute the total weighted travel mileage over the vehicle lifetime, which is used to estimate the impact of proposed fuel economy standards on future fuel consumption and operating costs. ("Current" refers to the 1995 VMT-Survivability schedule whereas "Updated" denotes newly acquired information utilized in updating the 1995 schedule.)

1.1. Passenger Cars

The 20-year schedule[1] for passenger car survivability currently in use by the National Highway Traffic Safety Administration (NHTSA) was developed from R.L. Polk & Company data on registered vehicles in use by model year over the calendar years 1975 to 1993. The vehicle miles traveled (VMT) schedule currently used for passenger cars is derived from the 1991 *Residential Transportation Energy Consumption Survey* (RTECS)—which was designed by the Energy Information Administration (EIA) of the Department of Energy (DOE)—to collect information on the use of energy in residential vehicles in the United States.

These passenger car schedules are shown in Table 1. The fourth column of Table 1, "Weighted Average Yearly Travel," is the product of the previous two columns—the survivability and VMT schedules. The average lifetime passenger car weighted VMT is simply the sum of the yearly average travel miles over the lifetime of the car. In this case, we estimated that a passenger car would last roughly 20 years and travel a lifetime mileage of 126,665 miles.

1.2. Light Trucks

The survivability and VMT 25 year schedules currently used by NHTSA for light truck regulatory impact analyses are shown in Table 2. Survivability data was obtained from 1975 to 1993 R.L. Polk and Company registrations on trucks in operation. Light truck VMT data was also taken from the 1991 RTECS.

The weighted yearly travel was again the product of survivability and VMT. The total light truck weighted VMT calculated from these schedules was 153,698 miles.

Note that based on the 1975 to 1993 Polk data, 7.9 percent of passenger cars are still on the road after 20 years and 12.1 percent of light trucks are still on the road after 25 years.

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[1] *Updated Vehicle Survivability and Travel Mileage Schedules*, NHTSA (Report Number: DOT HS 808 339), November 1995.

Table 1
Current Yearly Travel, Survival Probability, and Weighted Yearly Travel as a Function of Passenger Car Vehicle Age

Vehicle Age	Estimated Survivability	Estimated VMT (exponential model)	Weighted Average Yearly Travel Miles
1	0.995	13,533	13,459
2	0.988	12,989	12,839
3	0.978	12,466	12,191
4	0.962	11,964	11,505
5	0.938	11,482	10,776
6	0.908	11,020	10,005
7	0.870	10,577	9,200
8	0.825	10,151	8,376
9	0.775	9,742	7,549
10	0.721	9,350	6,737
11	0.644	8,974	5,779
12	0.541	8,613	4,662
13	0.445	8,266	3,675
14	0.358	7,933	2,843
15	0.285	7,614	2,167
16	0.223	7,308	1,632
17	0.174	7,014	1,218
18	0.134	6,731	902
19	0.103	6,460	665
20	0.079	6,200	488
	Lifetime Miles Traveled for Passenger Cars		126,665

Table 2
Current Yearly Travel, Survival Probability, and Weighted Yearly Travel as a Function of Light Truck Vehicle Age

Vehicle Age	Estimated Survivability	Estimated VMT (exponential model)	Weighted Average Yearly Travel Miles
1	0.998	12,885	12,853
2	0.995	12,469	12,401
3	0.989	12,067	11,937
4	0.980	11,678	11,450
5	0.967	11,302	10,932
6	0.949	10,938	10,376
7	0.924	10,585	9,782
8	0.894	10,244	9,154
9	0.857	9,914	8,498
10	0.816	9,594	7,825
11	0.795	9,285	7,378
12	0.734	8,985	6,593
13	0.669	8,696	5,820
14	0.604	8,415	5,079
15	0.539	8,144	4,387
16	0.476	7,882	3,755
17	0.418	7,628	3,187
18	0.364	7,382	2,686
19	0.315	7,144	2,250
20	0.271	6,913	1,875
21	0.232	6,691	1,555
22	0.198	6,475	1,285
23	0.169	6,266	1,058
24	0.143	6,064	869
25	0.121	5,869	712
	Lifetime Miles Traveled for Light Trucks		153,698

2. Data Sources

The primary source of data for determining vehicles in operation is the National Vehicle Population Profile (NVPP) compiled by R.L. Polk and Company. The NVPP is an annual census, as of July 1 of each year, of passenger cars and light trucks registered for on-road operation in the United States. NVPP registration data was utilized from vehicle model years 1977 to 2003. Survival rates were averaged for the five most recent model years for vehicles up to 20 years old.

Recent government-sponsored surveys of vehicle travel attempted to develop up-to-date VMT schedules. One such survey is the 2001 National Household Travel Survey (NHTS)—previously called the Nationwide Personal Transportation Survey (NPTS)—sponsored by the Federal Highway Administration, Bureau of Transportation Statistics, and the National Highway Traffic Safety Administration. The NHTS is the integration of two national travel surveys: the Federal Highway Administration-sponsored Nationwide Personal Transportation Survey (NPTS) and the Bureau of Transportation Statistics-sponsored American Travel Survey (ATS).

The Residential Transportation Energy Consumption Survey (RTECS) was designed by the Energy Information Administration (EIA) of the Department of Energy (DOE) to collect information on the use of energy in residential vehicles in the United States. Included are data regarding the number and type of vehicles in the residential sector, the characteristics of these vehicles, the per household and per vehicle VMT, the vehicle fuel consumption and expenditures, and vehicle fuel efficiencies. The DOE/EIA RTECS was discontinued after 1994, thus the NHTS was used in its place.

3. Survivability Analysis

3.1. Passenger Cars

The passenger car survival rate[2] schedule based on 1977 to 2003 NVPP registrations is shown in Table 3. Since the annual NVPP registration data is tabulated as of July 1 and model year production ends several months later, the total production for model year N will appear in the NVPP data for calendar year N+1. Therefore, the survivability for vehicles with age A will be found in NVPP calendar year N+1+A, which is A+1 years after model year N. Taking the 1977 model year (MY) vehicles as an example, calendar year (CY) 1978 is assumed to have the total production for MY 1977. Thus, CY 1978 would be the base-line year for MY 1977. In addition, CY 1978 would represent a vehicle age of zero years for MY 1977; CY 1979 vehicles would be one year old, and so on. Therefore, the original survival rates were adjusted upward by one year to reflect the actual survivability computed from the NVPP registration data.

A piece-wise linear relationship appeared to exist between "LN(–LN(1 – Survival Rate))" and "Vehicle Age." Two linear regressions were performed for cars up to and including 10 years old and for cars over 10 years old to produce an accurate estimate for survival rate as a function of vehicle age. This yielded the following:

Estimated Survival Rate = $1 - EXP[-EXP(A + B \times Age)]$ (regression model)

where,

		for Age ≤ 10	for Age > 10
A	=	1.64905	3.38136
B	=	-0.12143	-0.28623
r^2	=	0.9921	0.9985

The regression estimates produced a 0.9921 coefficient of determination (r^2) for vehicle age 10 years old and less, and 0.9985 for vehicles greater than 10 years old. The

[2] Survival rate as used in this report is defined as the ratio of the number of vehicles remaining in the fleet at a given year as compared to a base-line year. Continuing with the example from above, as mentioned before, the number of MY 1977 vehicles sold in CY 1978 would serve as the base-line year for MY 1977 vehicles. In other words, CY 1978 would represent year zero (a base-line year) for MY 1977 vehicles, and the survival rate of MY 1977 vehicles in CY 1978 would be 1.0 (the number of MY 1977 vehicles in the fleet divided by to the number of MY 1977 vehicles sold is equal to one). In the following year, CY 1979, MY 1977 vehicles would be one year old. We would expect that the number of MY 1977 vehicles to have diminished due to reasons such as accidents, thefts, etc. and thus the survival rate would be less then 1.0; for CY 1980, the survival rate would be less then that found in CY 1979, and so on.

A table of the survival rates as a function of the vehicle's age (rather than as a function of its model year or the calendar year) was generated so that vehicles of differing model years, but the same vehicle age, could be matched-up to arrive at a five-year average survival rate for a particular vehicle age (e.g., three year-old vehicles are averaged together but maybe comprised of vehicles from model years 1995, 1996, 1997, 1998, and 1999).

estimated survival rates were computed for vehicle ages 1 to 25 years old using the above regression model and appropriate regression coefficients, A and B.

The current passenger car estimated survivability schedule (1975 to 1993 NVPP data) is presented with the updated estimated survivability (1977 to 2002 NVPP data) in Figure 1. The current survivability is nearly equal to the updated survivability for newer cars up to five years old. For middle-aged to older cars between 6 and 20 years old, the updated survivability schedule indicates that newer cars are lasting longer as compared to the previous survivability schedule.

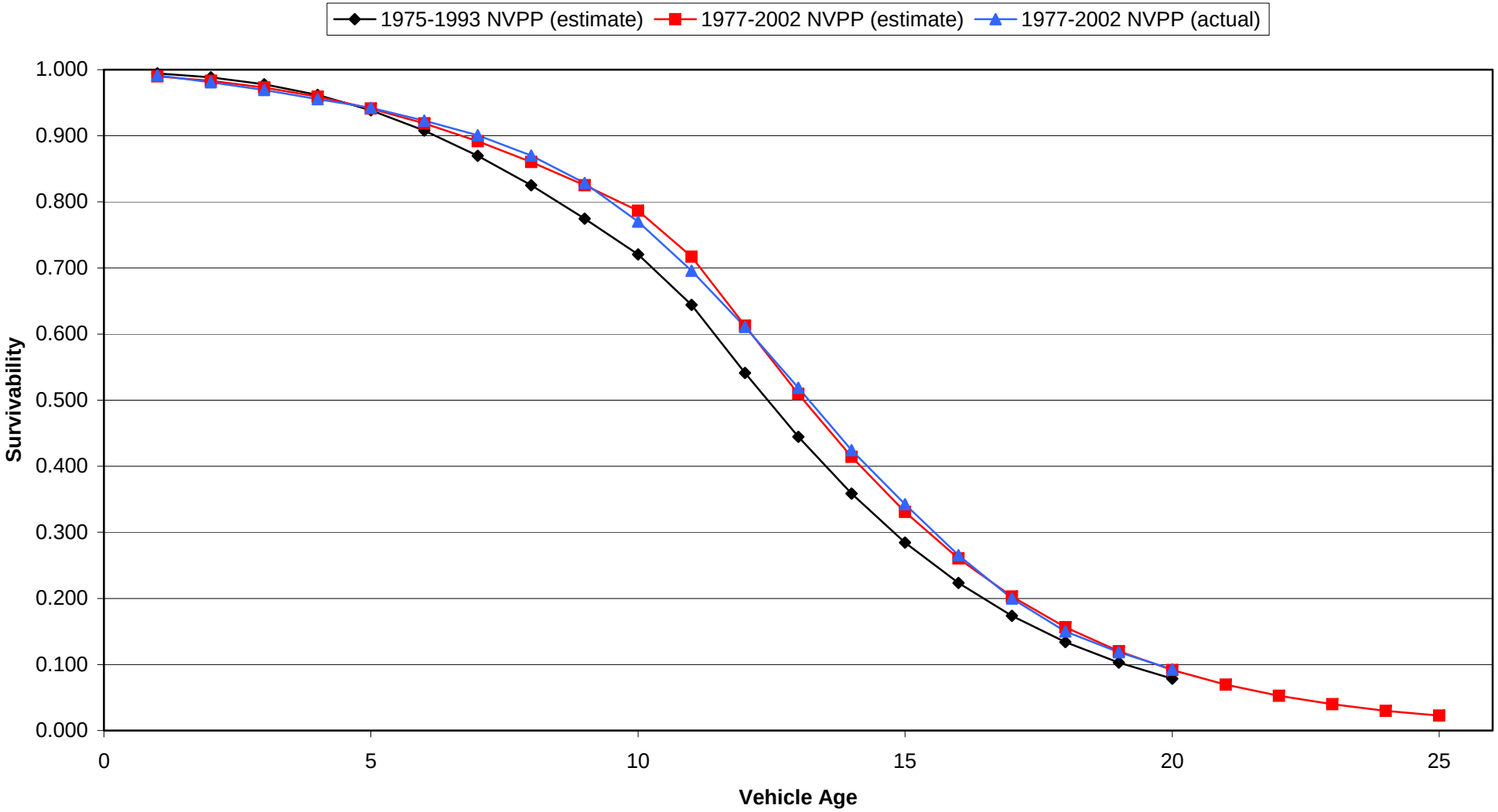
Table 3
Survivability of Passenger Cars by Vehicle Age
from 1977 to 2002 NVPP Registration Data

Vehicle Age	Adjusted Survival Rate	LN(1-SR)	LN(-LN(1-SR))	Estimated Survival Rate
1	0.9913	-4.7480	1.5577	0.9900
2	0.9809	-3.9571	1.3755	0.9831
3	0.9694	-3.4875	1.2492	0.9731
4	0.9555	-3.1130	1.1356	0.9593
5	0.9423	-2.8525	1.0482	0.9413
6	0.9227	-2.5603	0.9401	0.9188
7	0.9008	-2.3105	0.8374	0.8918
8	0.8703	-2.0426	0.7142	0.8604
9	0.8288	-1.7647	0.5680	0.8252
10	0.7703	-1.4708	0.3858	0.7866
11	0.6958	-1.1902	0.1741	0.7170
12	0.6107	-0.9435	-0.0581	0.6125
13	0.5187	-0.7312	-0.3130	0.5094
14	0.4244	-0.5524	-0.5935	0.4142
15	0.3425	-0.4193	-0.8691	0.3308
16	0.2653	-0.3083	-1.1766	0.2604
17	0.2000	-0.2231	-1.5000	0.2028
18	0.1500	-0.1626	-1.8167	0.1565
19	0.1185	-0.1262	-2.0703	0.1200
20	0.0928	-0.0974	-2.3288	0.0916
21				0.0696
22				0.0527
23				0.0399
24				0.0301
25				0.0227

Figure 1

Passenger Car Survivability

by Vehicle Age



3.2 Light Trucks

The light truck survivability computed from NVPP registrations is presented in Table 4. As was done with passenger cars, two linear regressions of "LN(–LN(1–Actual Survival Rate))" with the vehicle age adjusted were produced for light trucks up to and including 12 years of age and for light trucks greater than 12 years old. The cut-off point between the two linear regressions was increased by two years, relative to the previous study, for light trucks to produce a better fit and "smoother" curve.

Estimated Survival Rate = 1 – EXP[–EXP(A + B × Age)] (regression model)

		for Age ≤ 12	for Age > 12
A	=	1.42048	1.64815
B	=	-0.12470	-0.14373
r^2	=	0.97774	0.99662

A comparison of the current light truck survivability schedule with the updated survival rate schedule is presented in Figure 2. Unlike passenger cars, it is readily apparent that, based on the updated survivability schedule, younger light trucks are not lasting as long as younger light trucks from the current schedule. The most likely explanation is that there is an increase in usage of light trucks as passenger vehicles, thus raising the exposure of light trucks to crashes and rollovers. This trend lasts approximately until 20 years of age, achieving a maximum difference of about 0.1445 at 11 years of age. Beyond 20 years of age, the survivability rates of both schedules begin to converge.

It is interesting to compare the updated passenger car survival rates with updated light truck survival rates. A higher percentage of passenger cars are surviving longer early in their lives relative to light trucks of comparable vintage (up to about age 12). (Conversely, the 1995 VMT-survivability schedule illustrates the opposite trend, namely, light trucks are surviving longer early in their lives when compared to passenger cars.)

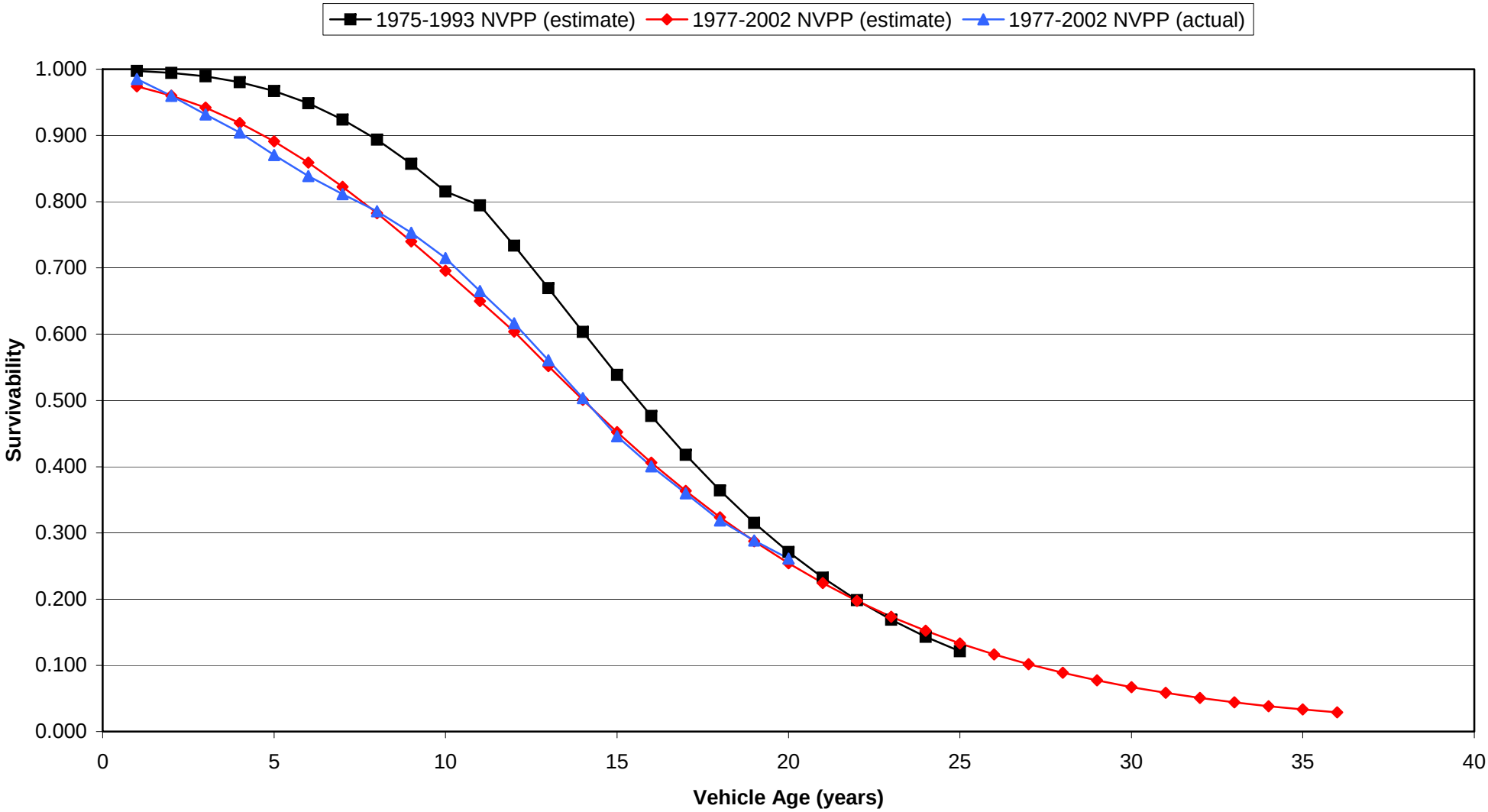
Table 4
Survivability of Light Trucks by Vehicle Age
from 1977 to 2002 NVPP Registration Data

Vehicle Age	Adjusted Survival Rate	LN(1-SR)	LN(-LN(1-SR))	Estimated Survival Rate
1	0.9854	-4.2247	1.4409	0.9741
2	0.9598	-3.2141	1.1675	0.9603
3	0.9318	-2.6857	0.9879	0.9420
4	0.9043	-2.3466	0.8530	0.9190
5	0.8704	-2.0431	0.7145	0.8913
6	0.8387	-1.8247	0.6014	0.8590
7	0.8114	-1.6683	0.5118	0.8226
8	0.7858	-1.5408	0.4323	0.7827
9	0.7533	-1.3998	0.3363	0.7401
10	0.7149	-1.2549	0.2270	0.6956
11	0.6651	-1.0938	0.0896	0.6501
12	0.6163	-0.9580	-0.0429	0.6040
13	0.5605	-0.8221	-0.1959	0.5517
14	0.5037	-0.7005	-0.3560	0.5009
15	0.4460	-0.5905	-0.5268	0.4522
16	0.4005	-0.5117	-0.6699	0.4062
17	0.3597	-0.4458	-0.8078	0.3633
18	0.3186	-0.3836	-0.9580	0.3236
19	0.2884	-0.3403	-1.0781	0.2873
20	0.2613	-0.3029	-1.1945	0.2542
21				0.2244
22				0.1975
23				0.1735
24				0.1522
25				0.1332
26				0.1165
27				0.1017
28				0.0887
29				0.0773
30				0.0673
31				0.0586
32				0.0509
33				0.0443
34				0.0385
35				0.0334
36				0.0290

Figure 2

Light Truck Survivability

by Vehicle Age



4. VMT Analysis

The annual vehicle miles traveled (VMT) as a function of vehicle age for passenger cars up to 25 years old and light trucks up to 30 years old with their respective weighting factor[3] from the 2001 NHTS is shown in Table 5 and Table 6, respectively. Prior to the 1995 NPTS, FHWA collected VMT data by asking consumers to estimate the number of miles they drive in a given year. Starting with the 1995 NPTS, FHWA changed their methodology and collected two odometer readings over a two-month period and then annualized the difference to arrive at an annual VMT. The data was collected over a 14-month period, starting in March 2001 and ending in May 2002. Since model year 2002 vehicles begin to appear in September 2001, and were already about eight months old by the end of the survey, it was assumed that 2002 vehicles were one year old in the VMT analysis, MY 2001 vehicles are two years old, and so on.

A brief overview of the methodology of how the final data set that was used is discussed herein. Focusing on the variable "VEHTYPE", for the passenger car VMT analysis, all records pertaining to automobile vehicle types were included whereas those relating to any other vehicle types were eliminated. Conversely, for the light truck VMT analysis, records dealing with passenger cars were eliminated. Also, all records pertaining to "Other", "Motorcycle", "Refused", and "Don't Know" were also removed.

Next, we looked at the variable "VEHYEAR." Since we could not calculate a vehicle without its model year, we eliminated all records pertaining to "Refused", "Don't Know", and "Not Ascertained"; in other words, those that did not respond were not included.

Lastly, we then turned to the variable "BESTMILE." All records pertaining to "Appropriate Skip", "Refused", "Don't Know", and "Not Ascertained" were eliminated. Doing this deleted all records for which "VEHTYPE" is "RV" or "Other Truck" (i.e., all BESTMILES were blank for those types at this point).

In addition, when the variable "BESTMILE"[4] was equal to zero, the record was flagged and the mileage was confirmed with another mileage variable, "ANNMILE." If "ANNMILE" was not zero, then the value of ANNMILE was taken to be the annual mileage. However, if "ANNMILE" was also zero, then it was assumed that the vehicle did, indeed, travel zero miles in a given year and the record was not included in the study.

[3] The weighting factors were derived based on various factors such the time of year sampled, geographic location, household size, and so on. More information can be found in Chapter 5 and Chapter 7, Section D of the 2001 NHTS User's Guide, which can be found at http://nhts.ornl.gov/2001/usersguide/index.shtml.

[4] The variable "BESTMILE" is an attempt to choose the best estimate of the annual mileage for a vehicle. This best guess is derived from two sources: an annualized mileage based on two odometer readings that are approximately two months apart (recorded in the variable "ANNUALIZED"); the other figure is based on a driver's reported estimate of how many miles were driven in a given year (variable "ANNMILES").

4.1. Passenger Cars

After inspection of the data, a linear relationship between VMT and vehicle age was postulated. In addition, whereas the current schedule assumed an exponential relationship between VMT and vehicle age, a cubic relationship between age and mileage was postulated and found to have a very good fit. Utilizing the statistical software package, STATA™ v8.2, a weighted regression analysis was performed, and resulted in the following:

Cubic Polynomial Model	Estimated VMT = $A \times (Age)^3 + B \times (Age)^2 + C \times (Age) + D$				
	A	**B**	**C**	**D**	**r^2**
	0.3672131	-13.21949	-232.8491	14476.36	0.9689

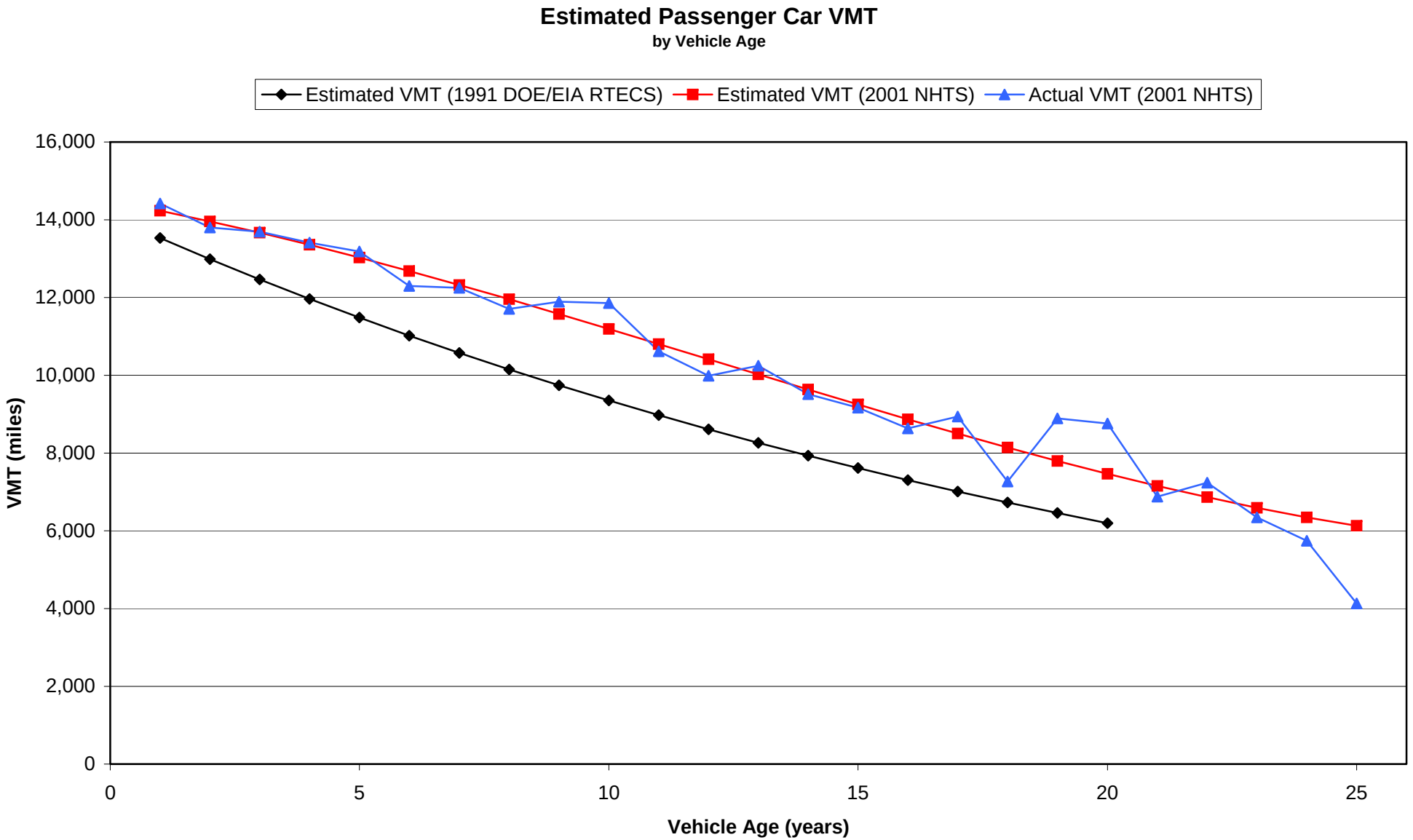
A comparison of the current and updated VMT schedules as well as the actual VMT data from the 2001 NHTS survey as a function of vehicle age is presented in Table 5 and Figure 3 for passenger vehicles.

Each record has an associated weighting factor accompanying it so that users of the NHTS data are able to, if need be, bring up the individual records to a representative level. The column "Sum of Weights" is the arithmetic sum of all the weighting factors for a particular age of a vehicle.

Table 5
VMT Schedule for Passenger Cars from 2001 FHWA NHTS

Vehicle Age (years)	Actual VMT (miles)	Sum of Weights	Estimated VMT Cubic Model
1	14,417	5,813,974	14,231
2	13,803	8,439,630	13,961
3	13,692	7,801,493	13,669
4	13,415	7,636,047	13,357
5	13,183	7,816,479	13,028
6	12,301	6,835,019	12,683
7	12,253	7,999,905	12,325
8	11,709	7,009,223	11,956
9	11,893	6,529,853	11,578
10	11,855	6,021,879	11,193
11	10,620	5,913,173	10,804
12	9,986	5,046,971	10,413
13	10,248	5,213,460	10,022
14	9,515	3,615,932	9,633
15	9,168	3,262,131	9,249
16	8,636	2,659,611	8,871
17	8,941	2,120,955	8,502
18	7,267	1,597,538	8,144
19	8,890	919,359	7,799
20	8,759	536,793	7,469
21	6,878	477,866	7,157
22	7,242	498,306	6,866
23	6,350	545,822	6,596
24	5,745	441,636	6,350
25	4,130	313,988	6,131

Figure 3


Estimated Passenger Car VMT
by Vehicle Age
Estimated VMT (1991 DOE/EIA RTECS)
Estimated VMT (2001 NHTS)
Actual VMT (2001 NHTS)
VMT (miles)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
5
10
15
20
25
Vehicle Age (years)

4.2. Light Trucks

Similar to passenger cars, a cubic model was hypothesized and a linear regression was performed based on the model.

Cubic Polynomial Model	Estimated VMT = $A \times (Age)^3 + B \times (Age)^2 + C \times (Age) + D$				
	A	**B**	**C**	**D**	**r^2**
	0.6806403	-22.844801	-238.5518	16345.32	0.9634

Unlike the passenger car where the linear regression curve declines as the vehicles age increases up to its lifespan of 25 years, for light trucks, we reach an inflection point[5] within the lifespan of the truck at an approximate vehicle age of 27 years. In other words, after year 27, the VMT begins to increase rather than steadily decrease. To remedy this problem, we take the lowest estimated VMT that the truck will travel and use that as the annual mileage for the remaining lifespan of the truck. Thus, the lowest mileage that we estimate the truck will travel occurs in year 27 with a value of 6,648 miles, and is the value we use up to remainder of the lifetime of the truck (36 years).

Cubic Polynomial Model	**Age ≤ 27**				
	Estimated VMT = $A \times (Age)^3 + B \times (Age)^2 + C \times (Age) + D$				
	A	**B**	**C**	**D**	**r^2**
	0.6806403	-22.84481	-238.5518	16345.32	0.9634
	27 < Age ≤ 36				
	Estimated VMT = 6,648				

The results are presented below in Table 6, and a comparison of the current and updated VMT as well as the actual VMT are available in Figure 4. In Table 6, The "Unadjusted" sub-column under the main column "Estimated VMT Cubic Model" lists the values of the annual mileage based on the cubic regression model from above. As mentioned before and evidenced in the table, at year 27 the VMT reaches a minimum and then begins to increase after that; the "Adjusted" sub-column corrects this by taking the lowest VMT reached (6,648 miles) and uses that value for the remainder of the lifetime of the light truck.

Judging from Figure 4 and comparing the "Actual VMT" with the estimated "Adjusted" VMT after year 27, this assumption seems to track well with the real-world data. To be certain, we performed a weighted average of the "Actual VMT" data from a vehicle age of 27 to 32, and arrive at a value of about 7,172 miles, which is not too far from our assumption of 6,648 miles. In addition, the VMT weighted by the survivability rate is of more relevance than the "unweighted" VMT, and since the survivability rates are fairly low after year 27, those weighted miles beyond year 27 contribute very little to the lifetime miles traveled. In fact, because the mileage is taken to be a constant 6,648 miles

[5] An inflection point is a point on a curve at which the sign of the curvature (i.e., the concavity) changes. In our case, the concavity changes from down (or negative) to up (or positive) at an approximate vehicle age of 27 years.

over time rather than decreasing, the weighted VMT (by survivability rate) and the lifetime VMT for light trucks are potentially over-estimated.

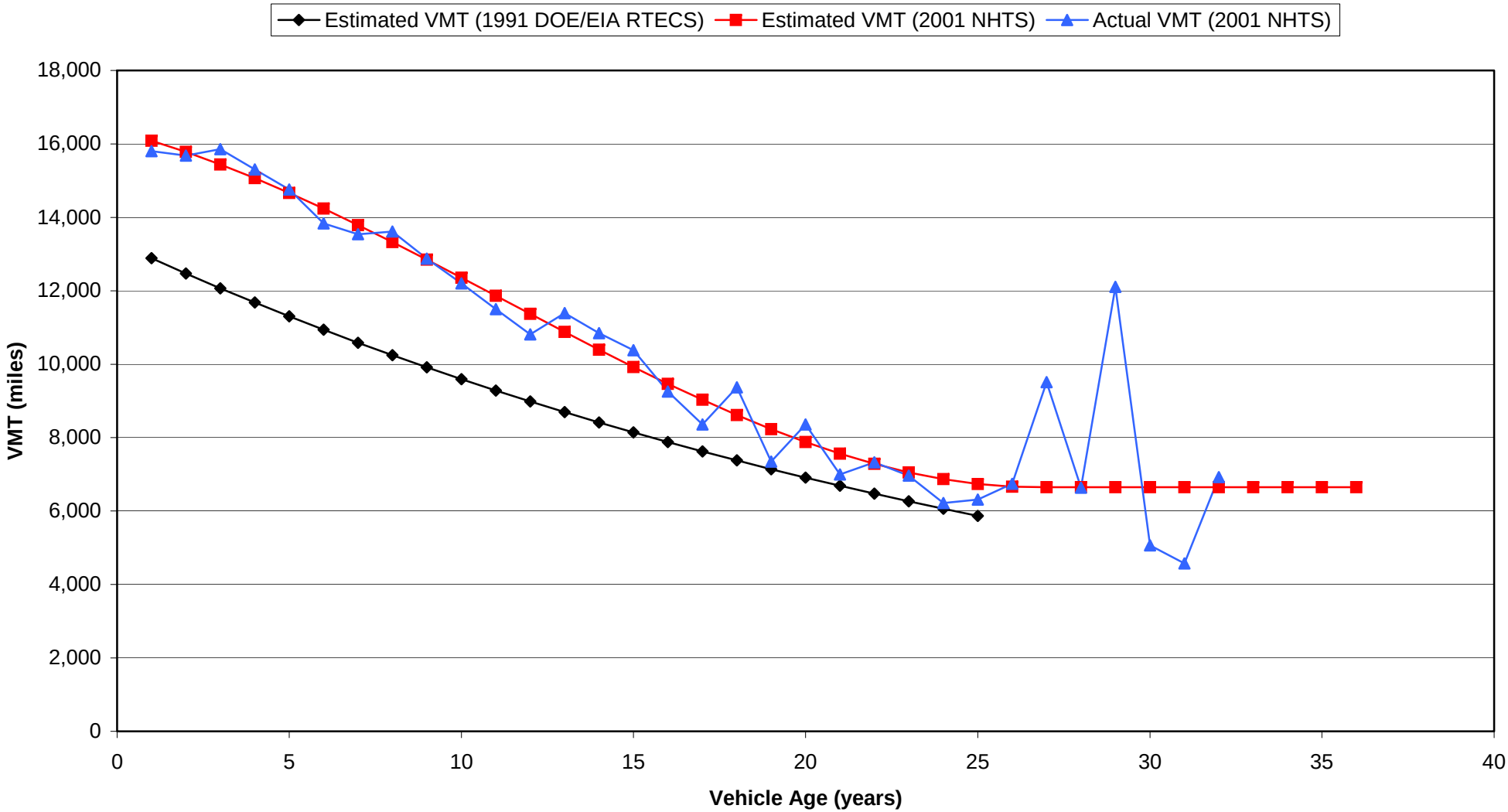
Table 6
VMT Schedule for Light Trucks from 2001 FHWA NHTS

Vehicle Age	Actual VMT	Sum of Weights	Estimated VMT Cubic Model	
			Unadjusted	Adjusted
1	15,806	5,612,464	16,085	16,085
2	15,683	7,432,237	15,782	15,782
3	15,859	6,745,541	15,442	15,442
4	15,302	6,062,588	15,069	15,069
5	14,762	5,315,874	14,667	14,667
6	13,836	4,720,786	14,239	14,239
7	13,542	4,611,752	13,790	13,790
8	13,615	4,519,253	13,323	13,323
9	12,875	3,623,754	12,844	12,844
10	12,203	3,167,817	12,356	12,356
11	11,501	2,723,295	11,863	11,863
12	10,815	2,694,645	11,369	11,369
13	11,391	2,596,898	10,879	10,879
14	10,843	2,228,663	10,396	10,396
15	10,378	1,849,371	9,924	9,924
16	9,259	1,907,149	9,468	9,468
17	8,358	1,495,622	9,032	9,032
18	9,371	1,149,093	8,619	8,619
19	7,352	738,596	8,234	8,234
20	8,363	448,094	7,881	7,881
21	6,999	353,464	7,565	7,565
22	7,327	329,249	7,288	7,288
23	6,969	609,914	7,055	7,055
24	6,220	500,876	6,871	6,871
25	6,312	357,861	6,739	6,739
26	6,745	272,612	6,663	6,663
27	9,515	224,307	6,648	6,648
28	6,635	152,987	6,697	6,648
29	12,108	196,936	6,815	6,648
30	5,067	278,648	7,006	6,648
31	4,577	144,194	7,273	6,648
32	6,923	124,329	7,622	6,648
33			8,055	6,648
34			8,578	6,648
35			9,194	6,648
36			9,907	6,648

Figure 4

Estimated Light Truck VMT

by Vehicle Age



5. Lifetime Mileage

5.1. Passenger Cars

The annual estimated weighted VMT and expected lifetime passenger car VMT (based on the updated 1977 to 2002 NVPP and 2001 NHTS data) is shown in Table 7. The "expected passenger car lifetime VMT" is calculated by summing the "estimated weighted VMT" over the number of years the vehicle is expected to be in service (25 years in the case of passenger cars), where the weighted VMT is simply the product of the "estimated survivability" and the "estimated VMT."

Figure 5 compares the current weighted VMT schedule with the updated weighted VMT schedule.

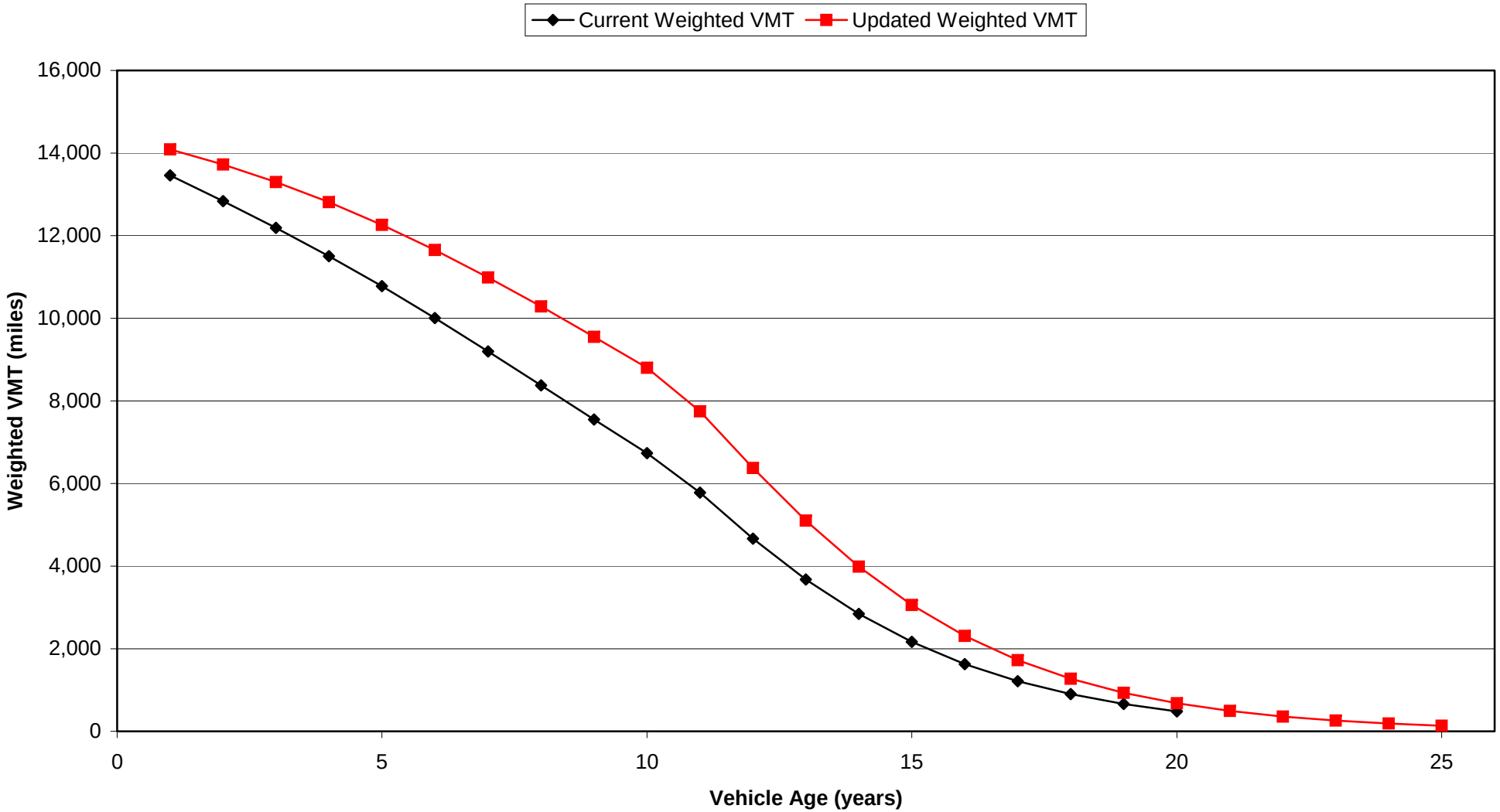
Table 7
Summary of Updated Results and Estimated Lifetime Passenger Car VMT

Vehicle Age	Estimated Survivability (1977 to 2002 NVPP)	Estimated VMT (2001 NHTS)	Weighted Yearly Travel Miles
1	0.9900	14,231	14,089
2	0.9831	13,961	13,725
3	0.9731	13,669	13,300
4	0.9593	13,357	12,813
5	0.9413	13,028	12,262
6	0.9188	12,683	11,652
7	0.8918	12,325	10,991
8	0.8604	11,956	10,287
9	0.8252	11,578	9,554
10	0.7866	11,193	8,804
11	0.7170	10,804	7,746
12	0.6125	10,413	6,378
13	0.5094	10,022	5,105
14	0.4142	9,633	3,990
15	0.3308	9,249	3,060
16	0.2604	8,871	2,310
17	0.2028	8,502	1,724
18	0.1565	8,144	1,275
19	0.1200	7,799	936
20	0.0916	7,469	684
21	0.0696	7,157	498
22	0.0527	6,866	362
23	0.0399	6,596	263
24	0.0301	6,350	191
25	0.0227	6,131	139
Estimated Passenger Car Lifetime VMT			152,137

Figure 5

Passenger Car Weighted VMT

by Vehicle Age



5.2. Light Trucks

The annual estimated weighted VMT and expected lifetime passenger car VMT (based on the updated 1977 to 2002 NVPP and 2001 NHTS data) is shown in Table 8. The "expected light truck lifetime VMT" is calculated by summing the "estimated weighted VMT" over the number of years the vehicle is expected to be in service (36 years in the case of light trucks), where the weighted VMT is simply the product of the "estimated survivability" and the "estimated VMT."

Figure 6 compares the current weighted VMT schedule with the updated weighted VMT schedule.

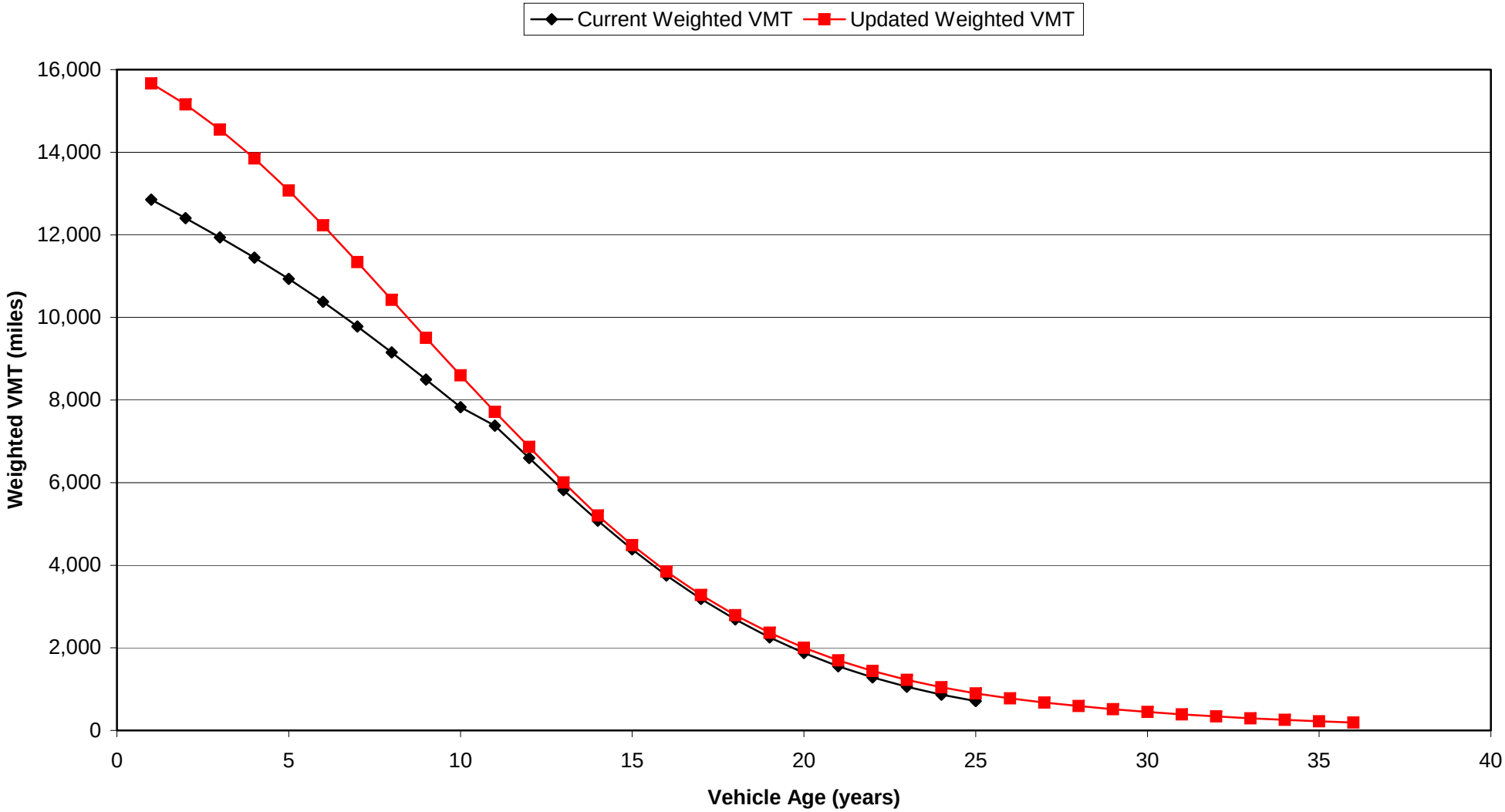
Table 8
Summary of Updated Results and Estimated Lifetime Light Truck VMT

Vehicle Age	Estimated Survivability (1977 to 2002 NVPP)	Estimated VMT (2001 NHTS)	Weighted Yearly Travel Miles
1	0.9741	16,085	15,668
2	0.9603	15,782	15,155
3	0.9420	15,442	14,547
4	0.9190	15,069	13,849
5	0.8913	14,667	13,072
6	0.8590	14,239	12,230
7	0.8226	13,790	11,343
8	0.7827	13,323	10,428
9	0.7401	12,844	9,506
10	0.6956	12,356	8,595
11	0.6501	11,863	7,712
12	0.6040	11,369	6,867
13	0.5517	10,879	6,002
14	0.5009	10,396	5,207
15	0.4522	9,924	4,488
16	0.4062	9,468	3,846
17	0.3633	9,032	3,281
18	0.3236	8,619	2,790
19	0.2873	8,234	2,366
20	0.2542	7,881	2,004
21	0.2244	7,565	1,697
22	0.1975	7,288	1,440
23	0.1735	7,055	1,224
24	0.1522	6,871	1,046
25	0.1332	6,739	898
26	0.1165	6,663	776
27	0.1017	6,648	676
28	0.0887	6,648	590
29	0.0773	6,648	514
30	0.0673	6,648	448
31	0.0586	6,648	389
32	0.0509	6,648	339
33	0.0443	6,648	294
34	0.0385	6,648	256
35	0.0334	6,648	222
36	0.0290	6,648	193
Estimated Lifetime Light Truck VMT			179,954

Figure 6

Light Truck Weighted VMT

by Vehicle Age



6. Discount Factors

Frequently, the agency discounts future safety benefits or fuel economy impacts back to present value to compare them to costs that incur when the vehicle is purchased. The present discount factors used are based on half-year discount rates with the following formula:

$$\text{Present Discount Factor} = \frac{1}{(1+i)^{N-\frac{1}{2}}} \qquad \textbf{Equation 1}$$

where, N = vehicle age (years)

i = discount rate (e.g., 3 percent, 7 percent, 10 percent).

Each present discount (PD) factor for a given vehicle age and discount rate is multiplied by their respective "Percent Total VMT" to arrive at the "Weighted Present Discount (PD) Factors" in the last columns of Tables 9 and 10. For example in Table 9a, passenger cars with a vehicle age of 10 years and a discount rate of 3 percent results in a weighted present discount factor of 0.0437 (results from multiplying the percent total VMT of 5.79 percent by the present discount value factor of 0.7552).

Summing the entire range of "Annual Weighted Present Discount Factor" for a particular vehicle and discount rate gives us the "Lifetime Weighted Present Value Discount Factor" for that particular vehicle type and at that discount rate; for passenger cars, 0.8304 (at 3 percent), 0.6700 (7 percent), and 0.5824 (10 percent); for light trucks, 0.8022 (at 3 percent), 0.6303 (7 percent), and 0.5419 (10 percent).

Table 9a

Updated Passenger Car Weighted Present Value Discount Factor (at 3 Percent)

Vehicle Age (years)	VMT	Survival Probability	Weighted VMT	Percent of Total VMT	Present Discount Factors	Annual Weighted PD Factors at **3%**
1	14,231	0.9900	14,089	9.26%	0.9853	0.0912
2	13,961	0.9831	13,725	9.02%	0.9566	0.0863
3	13,669	0.9731	13,300	8.74%	0.9288	0.0812
4	13,357	0.9593	12,813	8.42%	0.9017	0.0759
5	13,028	0.9413	12,262	8.06%	0.8755	0.0706
6	12,683	0.9188	11,652	7.66%	0.8500	0.0651
7	12,325	0.8918	10,991	7.22%	0.8252	0.0596
8	11,956	0.8604	10,287	6.76%	0.8012	0.0542
9	11,578	0.8252	9,554	6.28%	0.7778	0.0488
10	11,193	0.7866	8,804	5.79%	0.7552	0.0437
11	10,804	0.7170	7,746	5.09%	0.7332	0.0373
12	10,413	0.6125	6,378	4.19%	0.7118	0.0298
13	10,022	0.5094	5,105	3.36%	0.6911	0.0232
14	9,633	0.4142	3,990	2.62%	0.6710	0.0176
15	9,249	0.3308	3,060	2.01%	0.6514	0.0131
16	8,871	0.2604	2,310	1.52%	0.6324	0.0096
17	8,502	0.2028	1,724	1.13%	0.6140	0.0070
18	8,144	0.1565	1,275	0.84%	0.5961	0.0050
19	7,799	0.1200	936	0.62%	0.5788	0.0036
20	7,469	0.0916	684	0.45%	0.5619	0.0025
21	7,157	0.0696	498	0.33%	0.5456	0.0018
22	6,866	0.0527	362	0.24%	0.5297	0.0013
23	6,596	0.0399	263	0.17%	0.5142	0.0009
24	6,350	0.0301	191	0.13%	0.4993	0.0006
25	6,131	0.0227	139	0.09%	0.4847	0.0004
Lifetime Weighted Present Value Discount Factor						0.8304

Table 9b

Updated Passenger Car Weighted Present Value Discount Factor (at 7 Percent)

Vehicle Age (years)	VMT	Survival Probability	Weighted VMT	Percent of Total VMT	Present Discount Factors	Annual Weighted PD Factors at **7%**
1	14,231	0.9900	14,089	9.26%	0.9667	0.0895
2	13,961	0.9831	13,725	9.02%	0.9035	0.0815
3	13,669	0.9731	13,300	8.74%	0.8444	0.0738
4	13,357	0.9593	12,813	8.42%	0.7891	0.0665
5	13,028	0.9413	12,262	8.06%	0.7375	0.0594
6	12,683	0.9188	11,652	7.66%	0.6893	0.0528
7	12,325	0.8918	10,991	7.22%	0.6442	0.0465
8	11,956	0.8604	10,287	6.76%	0.6020	0.0407
9	11,578	0.8252	9,554	6.28%	0.5626	0.0353
10	11,193	0.7866	8,804	5.79%	0.5258	0.0304
11	10,804	0.7170	7,746	5.09%	0.4914	0.0250
12	10,413	0.6125	6,378	4.19%	0.4593	0.0193
13	10,022	0.5094	5,105	3.36%	0.4292	0.0144
14	9,633	0.4142	3,990	2.62%	0.4012	0.0105
15	9,249	0.3308	3,060	2.01%	0.3749	0.0075
16	8,871	0.2604	2,310	1.52%	0.3504	0.0053
17	8,502	0.2028	1,724	1.13%	0.3275	0.0037
18	8,144	0.1565	1,275	0.84%	0.3060	0.0026
19	7,799	0.1200	936	0.62%	0.2860	0.0018
20	7,469	0.0916	684	0.45%	0.2673	0.0012
21	7,157	0.0696	498	0.33%	0.2498	0.0008
22	6,866	0.0527	362	0.24%	0.2335	0.0006
23	6,596	0.0399	263	0.17%	0.2182	0.0004
24	6,350	0.0301	191	0.13%	0.2039	0.0003
25	6,131	0.0227	139	0.09%	0.1906	0.0002
Lifetime Weighted Present Value Discount Factor						0.6700

Table 9c

Updated Passenger Car Weighted Present Value Discount Factor (at 10 Percent)

Vehicle Age (years)	VMT	Survival Probability	Weighted VMT	Percent of Total VMT	Present Discount Factors	Annual Weighted PD Factors at **10%**
1	14,231	0.9900	14,089	9.26%	0.9535	0.0883
2	13,961	0.9831	13,725	9.02%	0.8668	0.0782
3	13,669	0.9731	13,300	8.74%	0.7880	0.0689
4	13,357	0.9593	12,813	8.42%	0.7164	0.0603
5	13,028	0.9413	12,262	8.06%	0.6512	0.0525
6	12,683	0.9188	11,652	7.66%	0.5920	0.0453
7	12,325	0.8918	10,991	7.22%	0.5382	0.0389
8	11,956	0.8604	10,287	6.76%	0.4893	0.0331
9	11,578	0.8252	9,554	6.28%	0.4448	0.0279
10	11,193	0.7866	8,804	5.79%	0.4044	0.0234
11	10,804	0.7170	7,746	5.09%	0.3676	0.0187
12	10,413	0.6125	6,378	4.19%	0.3342	0.0140
13	10,022	0.5094	5,105	3.36%	0.3038	0.0102
14	9,633	0.4142	3,990	2.62%	0.2762	0.0072
15	9,249	0.3308	3,060	2.01%	0.2511	0.0050
16	8,871	0.2604	2,310	1.52%	0.2283	0.0035
17	8,502	0.2028	1,724	1.13%	0.2075	0.0024
18	8,144	0.1565	1,275	0.84%	0.1886	0.0016
19	7,799	0.1200	936	0.62%	0.1715	0.0011
20	7,469	0.0916	684	0.45%	0.1559	0.0007
21	7,157	0.0696	498	0.33%	0.1417	0.0005
22	6,866	0.0527	362	0.24%	0.1288	0.0003
23	6,596	0.0399	263	0.17%	0.1171	0.0002
24	6,350	0.0301	191	0.13%	0.1065	0.0001
25	6,131	0.0227	139	0.09%	0.0968	0.0001
Lifetime Weighted Present Value Discount Factor						0.5824

Table 10a

Updated Light Truck Weighted Present Value Discount Factor (at 3 Percent)

Vehicle Age (years)	VMT	Survival Probability	Weighted VMT	Percent of Total VMT	Present Discount Factors	Annual Weighted PD Factors at **3%**
1	16,085	0.9741	15,668	8.71%	0.9853	0.0858
2	15,782	0.9603	15,155	8.42%	0.9566	0.0806
3	15,442	0.9420	14,547	8.08%	0.9288	0.0751
4	15,069	0.9190	13,849	7.70%	0.9017	0.0694
5	14,667	0.8913	13,072	7.26%	0.8755	0.0636
6	14,239	0.8590	12,230	6.80%	0.8500	0.0578
7	13,790	0.8226	11,343	6.30%	0.8252	0.0520
8	13,323	0.7827	10,428	5.79%	0.8012	0.0464
9	12,844	0.7401	9,506	5.28%	0.7778	0.0411
10	12,356	0.6956	8,595	4.78%	0.7552	0.0361
11	11,863	0.6501	7,712	4.29%	0.7332	0.0314
12	11,369	0.6040	6,867	3.82%	0.7118	0.0272
13	10,879	0.5517	6,002	3.34%	0.6911	0.0230
14	10,396	0.5009	5,207	2.89%	0.6710	0.0194
15	9,924	0.4522	4,488	2.49%	0.6514	0.0162
16	9,468	0.4062	3,846	2.14%	0.6324	0.0135
17	9,032	0.3633	3,281	1.82%	0.6140	0.0112
18	8,619	0.3236	2,790	1.55%	0.5961	0.0092
19	8,234	0.2873	2,366	1.31%	0.5788	0.0076
20	7,881	0.2542	2,004	1.11%	0.5619	0.0063
21	7,565	0.2244	1,697	0.94%	0.5456	0.0051
22	7,288	0.1975	1,440	0.80%	0.5297	0.0042
23	7,055	0.1735	1,224	0.68%	0.5142	0.0035
24	6,871	0.1522	1,046	0.58%	0.4993	0.0029
25	6,739	0.1332	898	0.50%	0.4847	0.0024
26	6,663	0.1165	776	0.43%	0.4706	0.0020
27	6,648	0.1017	676	0.38%	0.4569	0.0017
28	6,648	0.0887	590	0.33%	0.4436	0.0015
29	6,648	0.0773	514	0.29%	0.4307	0.0012
30	6,648	0.0673	448	0.25%	0.4181	0.0010
31	6,648	0.0586	389	0.22%	0.4059	0.0009
32	6,648	0.0509	339	0.19%	0.3941	0.0007
33	6,648	0.0443	294	0.16%	0.3826	0.0006
34	6,648	0.0385	256	0.14%	0.3715	0.0005
35	6,648	0.0334	222	0.12%	0.3607	0.0004
36	6,648	0.0290	193	0.11%	0.3502	0.0004
Lifetime Weighted Present Value Discount Factor						0.8022

Table 10b
Updated Light Truck Weighted Present Value Discount Factor (at 7 Percent)

Vehicle Age (years)	VMT	Survival Probability	Weighted VMT	Percent of Total VMT	Present Discount Factors	Annual Weighted PD Factors at **7%**
1	16,085	0.9741	15,668	8.71%	0.9667	0.0842
2	15,782	0.9603	15,155	8.42%	0.9035	0.0761
3	15,442	0.9420	14,547	8.08%	0.8444	0.0683
4	15,069	0.9190	13,849	7.70%	0.7891	0.0607
5	14,667	0.8913	13,072	7.26%	0.7375	0.0536
6	14,239	0.8590	12,230	6.80%	0.6893	0.0468
7	13,790	0.8226	11,343	6.30%	0.6442	0.0406
8	13,323	0.7827	10,428	5.79%	0.6020	0.0349
9	12,844	0.7401	9,506	5.28%	0.5626	0.0297
10	12,356	0.6956	8,595	4.78%	0.5258	0.0251
11	11,863	0.6501	7,712	4.29%	0.4914	0.0211
12	11,369	0.6040	6,867	3.82%	0.4593	0.0175
13	10,879	0.5517	6,002	3.34%	0.4292	0.0143
14	10,396	0.5009	5,207	2.89%	0.4012	0.0116
15	9,924	0.4522	4,488	2.49%	0.3749	0.0093
16	9,468	0.4062	3,846	2.14%	0.3504	0.0075
17	9,032	0.3633	3,281	1.82%	0.3275	0.0060
18	8,619	0.3236	2,790	1.55%	0.3060	0.0047
19	8,234	0.2873	2,366	1.31%	0.2860	0.0038
20	7,881	0.2542	2,004	1.11%	0.2673	0.0030
21	7,565	0.2244	1,697	0.94%	0.2498	0.0024
22	7,288	0.1975	1,440	0.80%	0.2335	0.0019
23	7,055	0.1735	1,224	0.68%	0.2182	0.0015
24	6,871	0.1522	1,046	0.58%	0.2039	0.0012
25	6,739	0.1332	898	0.50%	0.1906	0.0010
26	6,663	0.1165	776	0.43%	0.1781	0.0008
27	6,648	0.1017	676	0.38%	0.1665	0.0006
28	6,648	0.0887	590	0.33%	0.1556	0.0005
29	6,648	0.0773	514	0.29%	0.1454	0.0004
30	6,648	0.0673	448	0.25%	0.1359	0.0003
31	6,648	0.0586	389	0.22%	0.1270	0.0003
32	6,648	0.0509	339	0.19%	0.1187	0.0002
33	6,648	0.0443	294	0.16%	0.1109	0.0002
34	6,648	0.0385	256	0.14%	0.1037	0.0001
35	6,648	0.0334	222	0.12%	0.0969	0.0001
36	6,648	0.0290	193	0.11%	0.0905	0.0001
Lifetime Weighted Present Value Discount Factor						0.6303

Table 10c
Updated Light Truck Weighted Present Value Discount Factor (at 10 Percent)

Vehicle Age (years)	VMT	Survival Probability	Weighted VMT	Percent of Total VMT	Present Discount Factors	Annual Weighted PD Factors at **10%**
1	16,085	0.9741	15,668	8.71%	0.9535	0.0830
2	15,782	0.9603	15,155	8.42%	0.8668	0.0730
3	15,442	0.9420	14,547	8.08%	0.7880	0.0637
4	15,069	0.9190	13,849	7.70%	0.7164	0.0551
5	14,667	0.8913	13,072	7.26%	0.6512	0.0473
6	14,239	0.8590	12,230	6.80%	0.5920	0.0402
7	13,790	0.8226	11,343	6.30%	0.5382	0.0339
8	13,323	0.7827	10,428	5.79%	0.4893	0.0284
9	12,844	0.7401	9,506	5.28%	0.4448	0.0235
10	12,356	0.6956	8,595	4.78%	0.4044	0.0193
11	11,863	0.6501	7,712	4.29%	0.3676	0.0158
12	11,369	0.6040	6,867	3.82%	0.3342	0.0128
13	10,879	0.5517	6,002	3.34%	0.3038	0.0101
14	10,396	0.5009	5,207	2.89%	0.2762	0.0080
15	9,924	0.4522	4,488	2.49%	0.2511	0.0063
16	9,468	0.4062	3,846	2.14%	0.2283	0.0049
17	9,032	0.3633	3,281	1.82%	0.2075	0.0038
18	8,619	0.3236	2,790	1.55%	0.1886	0.0029
19	8,234	0.2873	2,366	1.31%	0.1715	0.0023
20	7,881	0.2542	2,004	1.11%	0.1559	0.0017
21	7,565	0.2244	1,697	0.94%	0.1417	0.0013
22	7,288	0.1975	1,440	0.80%	0.1288	0.0010
23	7,055	0.1735	1,224	0.68%	0.1171	0.0008
24	6,871	0.1522	1,046	0.58%	0.1065	0.0006
25	6,739	0.1332	898	0.50%	0.0968	0.0005
26	6,663	0.1165	776	0.43%	0.0880	0.0004
27	6,648	0.1017	676	0.38%	0.0800	0.0003
28	6,648	0.0887	590	0.33%	0.0727	0.0002
29	6,648	0.0773	514	0.29%	0.0661	0.0002
30	6,648	0.0673	448	0.25%	0.0601	0.0001
31	6,648	0.0586	389	0.22%	0.0546	0.0001
32	6,648	0.0509	339	0.19%	0.0497	0.0001
33	6,648	0.0443	294	0.16%	0.0452	0.0001
34	6,648	0.0385	256	0.14%	0.0411	0.0001
35	6,648	0.0334	222	0.12%	0.0373	0.0000
36	6,648	0.0290	193	0.11%	0.0339	0.0000
Lifetime Weighted Present Value Discount Factor						0.5419

7. Appendix

7.1. Corporate Average Fuel Economy (CAFE) VMT Schedules

For a great majority of rulemakings, vehicles are classified as either a passenger car or as a light truck with the vehicle miles traveled schedules created to reflect this fact. However, an exception to this practice are the Corporate Average Fuel Economy (CAFE) standards, in which the light truck categories are further discriminated into three sub-categories based upon the light truck's body type. These sub-categories are as follows, with the specific vehicle types following in a parenthetical expression:

- Pickups (open-bed trucks of all sizes);
- SUVs (sport wagons and utility vehicles of all sizes) and
- Vans (minivans, standard and large passenger vans, and cargo vans).

Passenger cars remain grouped in their own category and are not further divided, but are listed here for the sake of completeness:

- Passenger cars (coupes, sedans, station wagons, sports cars, and convertibles).

A least-squares fit of the vehicle miles traveled for each sub-category of light trucks by vehicle age is presented below in Table 11 alongside an aggregated VMT[6] for all light trucks. Since a separate regression was performed on separate sub-categories, the "shape" of the curves will not match that of the aggregated light truck curve, especially at the beginnings and ends of the curves. The mileage by year schedules for each sub-category—rather than the aggregated VMT—is used in rulemakings pertaining to fuel economy.

The linear regression model for the aggregated light truck VMT was presented earlier on page 17 of this report.

[6] The aggregated VMT schedule under the column heading in Table 11, "All Light Trucks," is created by combing all three sub-categories of light trucks (Pickups, SUVs and Vans) into one single group. This aggregated light truck VMT schedule also appears in Table 6 (p. 19), Table 8 (p. 25) and Tables 10a-10c (pp. 31-33).

Table 11
Average Annual Miles Driven by Age for Light-Duty Vehicles
(estimated values from equations fitted to data from 2002 NHTS)

Age	Passenger Cars	Light Trucks			
		All Light Trucks	Pickups	SUVs	Vans
1	14,231	16,085	16,869	16,270	16,321
2	13,961	15,782	16,270	15,786	15,951
3	13,669	15,442	15,681	15,316	15,555
4	13,357	15,069	15,105	14,859	15,135
5	13,028	14,667	14,541	14,417	14,693
6	12,683	14,239	13,990	13,988	14,234
7	12,325	13,790	13,453	13,571	13,759
8	11,956	13,323	12,931	13,167	13,271
9	11,578	12,844	12,424	12,775	12,774
10	11,193	12,356	11,932	12,395	12,270
11	10,804	11,863	11,457	12,025	11,763
12	10,413	11,369	10,999	11,667	11,255
13	10,022	10,879	10,559	11,320	10,750
14	9,633	10,396	10,138	10,983	10,249
15	9,249	9,924	9,736	10,656	9,757
16	8,871	9,468	9,353	10,338	9,275
17	8,502	9,032	8,991	10,031	8,808
18	8,144	8,619	8,650	9,732	8,358
19	7,799	8,234	8,331	9,442	7,927
20	7,469	7,881	8,034	9,161	7,519
21	7,157	7,565	7,761	8,888	7,137
22	6,866	7,288	7,511	8,623	6,783
23	6,596	7,055	7,285	8,367	6,461
24	6,350	6,871	7,085	8,118	6,174
25	6,131	6,739	6,911	7,876	5,923
26		6,663	6,762	7,641	5,714
27		6,648	6,641	7,414	5,547
28		6,648	6,548	7,193	5,427
29		6,648	6,483	6,979	5,355
30+		6,648	6,448	6,771	5,336

Figure 7

Average Annual Miles Driven by Different Classes of Light Trucks

by Vehicle Age